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is especially significant. From an exhaustive study of local floras he has drawn circumpolar biochores, connecting regions with similar proportions of chamaephytes. The biochores of 10 per cent, 20 per cent, and 30 per cent are chosen to separate four floral zones, which he distinguishes as follows: a cold temperate or hemicryptophyte zone, south of the 10 per cent biochore; a boreal zone, between the 10 per cent and 20 per cent biochores; an arctic zone, between the 20 per cent and 30 per cent biochores; and an arctic-nival zone beyond the 30 per cent line. The same methods are also applied to alpine floras, and the number of chamaephytes is found to increase in the same way with the altitude. RAUNKIAER'S chief object is apparently the recognition of certain types of climate, the results of which are expressed in the vegetation. His methods will probably have a much greater value in characterizing floral regions, irrespective of their climate, and will have the great advantage of basing the distinctions between regions upon the plants themselves, rather than upon any physical feature of the environment. It remains to be seen whether his chief biochores, chosen at certain round numbers and from one life form only, will eventually prove to be the most important.—H. A. GLEASON.

Gas movement.—OHNO¹⁶ has uncovered a most interesting situation in the rapid gaseous output from the leaf of *Nelumbo nucifera*. It is borne some distance above the water, and in the central region over the petiole there is a considerable depression. If on a warm sunny day one places some water in this depression, he will see a rapid extrusion of gas, which amounts to several times the volume of the leaf in a relatively short period. Analysis shows that the gas contains the percentage of O₂ found in air. A like volume is given off by a detached leaf with its petiole in water, even in darkness if the upper surface is warmed. All these facts show that it is not O₂ produced by photosynthesis, and indicate that it is air. Any condition that keeps the air over the leaf dry, sets up such an extrusion of gas. The phenomenon is best explained by the behavior of a model made by OHNO, which he states is a modification of forms before used, to show, in other connections, the physical principle which he believes is applicable here.

A porous clay cup is filled with moist sphagnum and the open end supplied with a one-holed rubber stopper and glass and rubber tubing. The end of the latter dips just a little under the water. The porous cup is heated gently on a warming stage. The air begins streaming out of the tube and continues until it amounts to several times the volume of the porous cup. It ceases only when the water supply of the sphagnum is exhausted. The air on the outside of the tube is relatively dry and the gas pressure there is mainly air. Inside there is a considerable water vapor pressure which decreases the air density. For this reason there is an inward diffusion of air, and, according to the Graham law, an even more rapid outward diffusion of water vapor. The lost water vapor is constantly resupplied by the moist sphagnum. There results an

¹⁶ OHNO, N., Ueber lebhaftes Gasausscheidung aus den Blättern von *Nelumbo nucifera* Gaertn. Zeitschr. Bot. 2:641-664. 1910.

increased internal pressure of gas which causes the streaming from the tube. This continues until the sphagnum is dry.

OHNO conceived that the leaf of *Nelumbo* acts in a similar way, taking in the air thus by diffusion, which increases the internal pressure and leads to an extrusion at the central region where the texture is loose. He examined a number of other plants, but found no other case of a similar exchange.—WILLIAM CROCKER.

Respiratory intensity.—ROSÉ¹⁷ finds that the respiratory intensities of leaves, measured by cc. of CO₂ given off per hour per gram of green weight, varies with the illumination under which the plant is grown, and also with the stage of development of the plant. *Pisum sativum* and *Teucrium Scorodonia* were grown under cloth screens of various thicknesses. The light stopped by the screens was measured by means of a Vidal photometer. ROSÉ used four light intensities: V is full sunlight, IV is $V-2x$, III is $V-16x$, II is $V-22x$, x being the amount of light absorbed by a 5 mm. glass plate. Leaves were taken from the plants at different stages of their development, inclosed in a chamber with a known quantity of air, and put in a dark room. After a time the gas in the chamber was analyzed. For *Pisum sativum*, when two leaves have developed, the maximum respiratory intensity was found to be at illumination V, and there is a gradual decrease to II; but in the later stages the maximum is either at III, with a secondary increase at V, or the reverse. ROSÉ found that the structure of leaves developed under III and II was greatly modified. There was less lignified tissue and less cellulose; therefore, he thinks, there must be a greater amount of protoplasm and of carbohydrates in a given weight of leaf. There is less water in III than in II, therefore a greater percentage of oxidizable substance per gram of green weight. So, the author says, the respiratory maximum is displaced from V, the place of greatest dry weight, to III, the place of greatest amount of oxidizable substances. *Teucrium Scorodonia*, on the other hand, being a shade plant, has its greatest respiratory energy at IV, with its greatest dry weight.

The author's explanations of his results are not convincing. Some quantitative determinations of the enzymes present would be of value. The results found for leaves under the different illuminations would have been more nearly comparable if the water variant had been eliminated by measuring the respiration for a unit of dry weight.—SOPHIA ECKERSON.

Sporogenous tissue of Piper Betel.—The work of JOHNSON among Piperaceae is well known to morphologists, and he has now extended it by including *P. Betel monoicum*,¹⁸ a climbing Jamaican species with monosporangiate

¹⁷ ROSÉ, EDMOND, Énergie respiratoire chez les plantes cultivées à divers éclaircissements. Rev. Gén. Botanique 22:385-398. 1910.

¹⁸ JOHNSON, DUNCAN S., Studies in the development of the Piperaceae. I. The suppression and extension of sporogenous tissue in the flower of *Piper Betel* L. var. *monoicum* C. DC. Jour. Exp. Zool. 9:715-749. figs. 71 (year of publication not cited in separate).